

## Lower gastrointestinal bleeding: a review

David A. Edelman, Choichi Sugawa

Department of Surgery, Wayne State University, Detroit, MI, USA

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### Abstract

Lower gastrointestinal bleeding (LGIB) continues to be a problem for physicians. Acute LGIB is defined as bleeding that emanates from a source distal to the ligament of Treitz. Although 80% of all LGIB will stop spontaneously, the identification of the bleeding source remains challenging and rebleeding can occur in 25% of cases. Some patients with severe hematochezia require urgent attention to minimize further bleeding and complications. This article reviews the causes, diagnostic methods, and endoscopic treatment of LGIB.

**Key words:** LGIB — Gastrointestinal bleeding — Colonoscopy — Review — Hematochezia

Lower gastrointestinal bleeding (LGIB) continues to be a problem for physicians. Acute LGIB is defined as bleeding that emanates from a source distal to the ligament of Treitz [19]. Although 80% of all LGIB will stop spontaneously, the identification of the bleeding source remains challenging and rebleeding can occur in 25% of cases [38]. Some patients with severe hematochezia require urgent attention to minimize further bleeding and complications.

Despite diagnostic advancements, in 10% of cases the location of LGIB cannot be identified [38]. The annual hospitalization incidence of LGIB is 22 cases per 100,000 adults in the United States [49, 90]. A 1997 survey of GI bleeding from the American College of Gastroenterology found that lower GI hemorrhage accounted for 24% of all GI bleeding events [63]. LGIB accounts for approximately 0.5% of all short-term hospital admissions in the United States [67].

LGIB is a more significant problem in males [63] and elderly patients, with a greater than 200-fold increase in incidence in 80 year olds compared with patients in their 20s [49]. The rise in incidence with age may be explained

by the increasing prevalence of colonic diverticulosis and colonic angiodysplasia [11]. The mean age of patients with LGIB ranges between 63 and 77 years [49, 63]. There is an increase in morbidity seen in older patients with LGIB secondary to their comorbidities and their associated medication use (NSAIDs) [79].

Patients require surgery more often when LGIB is from a lower GI source than an upper source [63]; if they receive more than four units of blood in the first 24 hours, patients have 50% chance of requiring surgery [25]. The mortality from LGIB is 5% or less [12, 49, 70], but it can reach 23% if the bleeding occurred after hospitalization [49]. For those patients requiring more than two units of blood, mortality increases to 15% [25].

Clinically, the most common presentation of LGIB is hematochezia, though melena, hemodynamic instability, anemia, and abdominal pain can be seen [63]. Hematochezia is defined as gross blood seen either on toilet paper after defecation or mixed with stool. Hematochezia can occur in apparently well individuals [21]. Melena is defined as black stools resulting from the oxidation of hematin in the gut. Occult bleeding is slow and chronic, frequently leading to anemia as a first sign of blood loss.

The stability of the patient and the rate of bleeding dictate the order in which various diagnostic procedures should be conducted [52]. Resuscitation efforts should take place concurrently with the initial evaluation of the patient to prevent complications of blood loss. An initial hematocrit of less than 35%, the presence of abnormal vital signs one hour after initial medical evaluation, and gross blood on initial rectal examination are independent predictors of severe LGIB and adverse outcome [85].

### Diagnosis of LGIB

Diagnosis of the etiology and location of acute LGIB can be puzzling. For patients who present with severe hematochezia, the diagnostic and therapeutic approach is not standardized in most medical centers [11]. Several strategies are available and largely depend on staff

experience and skills. The significant risk of life-threatening blood loss makes a prompt and accurate diagnosis important in patient management. Predictions of the source of bleeding through associated clinical signs and symptoms have been highly inaccurate [53].

The necessity of nasogastric (NG) tube placement and gastric lavage in the setting of acute LGIB to exclude an upper-GI source has not been studied prospectively. A clear NG-tube aspirate does not rule out an upper-GI source, whereas the presence of bile makes an upper source unlikely [16].

Diagnostic and therapeutic approaches for patients with severe LGIB vary among institutions. The relative value and appropriate order in which investigations (barium enema, colonoscopy, nuclear scan, and angiography) should be done have been hotly debated in the past [1]. It is our belief that patients should undergo colonoscopy early. When possible, colonoscopy should be performed after preparation of the colon using polyethylene glycol-based solutions.

#### *History and physical exam*

In most cases of LGIB, there are no symptoms of abdominal pain, except in ischemia and inflammatory bowel disease. In obtaining the patient's history, bleeding should be characterized by frequency, color, and the presence or absence of thrombus. History of medications used is important, especially anticoagulants such as warfarin, low-molecular-weight heparins, and inhibitors of platelet aggregation. All patients with complaints of LGIB should have a documented digital rectal exam within hours of presentation.

#### *Colonoscopy*

Colonoscopy is safe and has established low morbidity and mortality rates [5, 24]. In a recent prospective study of 3196 patients, significant morbidity considered to be related to colonoscopy occurred in 9 of 3196 procedures (0.3%). In subjects undergoing only diagnostic procedures, the major complication rate was 0.1% [59]. Perforation of the colon, which requires surgical intervention more frequently than bleeding, occurs in less than 1% of patients who undergo diagnostic colonoscopy and may be seen in up to 3% percent of patients who undergo therapeutic procedures such as polyp removal, dilation of strictures, or laser ablative procedures [17].

The diagnostic accuracy of colonoscopy ranges from 72% to 86% in the setting of LGIB, and cecal intubation is achieved in greater than 95% of attempts [11]. Richter et al. [70] demonstrated that the yield from colonoscopy is greater when done earlier in the hospital stay, and patients who undergo colonoscopy for LGIB have a shorter length of stay compared with those who did not. Strate and Syngal [82] noted that in 144 patients with acute LGIB, earlier completion of colonoscopy resulted in a shorter length of stay. Colonoscopy leads to the greatest number of specific diagnoses and opportunities

for directed therapy in acute LGIB [40]. In addition, colonoscopy is a cost-effective method for evaluating otherwise asymptomatic rectal bleeding [2]. Virtual colonoscopy can be used to rule out a proximal colonic lesion in patients who have had an incomplete colonoscopy [39].

In a study of 85 patients in whom colonoscopy was used as the primary investigative method for the diagnosis and treatment of acute LGIB, sources of bleeding were correctly identified in 82 of the 85 patients [14]. Furthermore, colonoscopy was the only investigation needed in 90% of those 85 patients.

#### *Angiography*

If the rate of ongoing arterial bleeding is at least 0.5 ml/min, angiography may show extravasation of contrast into the lumen to identify a bleeding site. Angiography is an invasive procedure, which can result in complications including contrast-induced renal failure, arterial injury, and mesenteric ischemia [14]. Active arterial bleeding is generally required for positive angiographic localization, and because most LGIB is intermittent, the results can be quite variable.

In a study of 68 patients who underwent emergency arteriography for massive lower GI hemorrhage, the bleeding source was localized in 27 (40%), with a sensitivity of 65% among patients requiring emergency resection [44]. The 68 patients in this study were transfused an average of six units of pack red blood cells within 24 hours of admission. Another study reported on 50 patients with massive LGIB who were initially managed with emergency angiography [13]. In this group, the average age was 67.2 years, mean hematocrit was 23.7, and average transfusion was 7.6 units. Thirty-six patients (72%) had the bleeding site located with emergency angiography.

Angiographic localization also allows for vasopressin infusion, embolization, and selective catheter localization for potential therapy [6, 13, 54, 62]. When a bleeding site is identified on angiography, effective treatment by superselective gastrointestinal embolization is predicated by three factors: decreased arterial perfusion pressure to the bleeding site, local vasospasm, and the patient's ability to form clots [29]. In other words, arterial inflow must be decreased enough to allow hemostasis but not to the degree that causes total devascularization [30].

#### *Nuclear scans*

The threshold rate of GI bleeding for localization with radioisotope scanning is about 0.1 ml/min or more. Nuclear scans are either technetium sulfur colloid (short half-life) or technetium-labeled red blood cells (RBCs) (24 h). Injection of labeled RBCs and early scanning (at least 30 min, 60 min, and 4 h) is recommended to identify potential bleeding sites. Delayed scans are not reliable for localization in the gut. These studies are difficult to interpret, have poor accuracy in localizing a

bleeding site, and poorly predict subsequent angiogram results [37, 46]. A limited colonic resection should not be based on only a positive nuclear scan [64, 79].

### *Barium enema*

Barium enema is a quick and noninvasive exam; however, it can fail to identify the source of hemorrhage in up to 30% of the cases [60]. A barium enema cannot demonstrate active bleeding, it is technically inadequate in critically ill patients, and it misses superficial lesions such as colitis. Thus, barium enema has no role in the assessment of severe hematochezia. Furthermore, the barium interferes with subsequent evaluation by colonoscopy or angiography. Even when a barium enema is positive, there is no assurance that the finding is responsible for the bleeding.

### *Small-bowel evaluation*

Occasionally LGIB is from the small intestine and is difficult to visualize with standard endoscopy. Patients with negative colonoscopy and negative upper endoscopy should have an evaluation of their small bowel. Push enteroscopy is an option and provides examination of the proximal 60–80 cm of the jejunum.

Capsule endoscopy is a simple, noninvasive way to study the small intestine. Its diagnostic yield has been reported as high as 92% in obscure GI bleeding [61]. The ability of capsule endoscopy in detecting small-bowel lesions is superior to radiology and CT scan [15, 31, 47]. In one prospective study of 60 patients designed to compare diagnostic yield of capsule endoscopy with push enteroscopy, capsule endoscopy was reported to be more sensitive and specific when compared with enteroscopy, although it does not permit biopsies to be taken [76].

### **Causes of LGIB**

In our experience with acute LGIB in 695 patients admitted to an urban emergency medical center, common causes of LGIB included diverticulosis, hemorrhoids, cancer, inflammatory disease; polyps, ischemic colitis, angiodysplasia, rectal ulcer, colonic polyps, and delayed bleeding from postpolypectomy ulcer. Of the 695 patients, 1.5% had a small-bowel source and 2.4% had no identified source. The findings from urgent colonoscopy permitted triage of low-risk patients to less intensive and less expensive care which often facilitated early discharge.

### *Diverticulosis*

Acquired diverticula form through the relative weakness in the muscle wall of the colon at the site where arteries (the vasa recta) penetrate the muscularis layer to reach the mucosa and submucosa [75]. Diverticula generally are multiple. Each diverticulum is typically 5–10 mm in

diameter, but at times they can exceed 20 mm. The most common site is the sigmoid colon, although diverticula can occur throughout the large bowel.

The true prevalence of diverticula is unknown, but in one large observational study of 9086 consecutive patients undergoing colonoscopy for all indications, the overall prevalence was 27% and increased with patient age [48]. In another study, the reported prevalence of colonic diverticulosis in Western societies is 37%–45% [35]. It is estimated that half of the population over 50 years old in the United States have colonic diverticula.

Approximately 17% of patients with colonic diverticulosis experience bleeding, which may range from minor to severe and life-threatening [73]. Diverticular bleeding is the most common cause for patients hospitalized with severe hematochezia. Approximately 20% of patients with diverticular bleeding have stigmata of definitive hemorrhage, 30% have presumed diverticular bleeding, and 50% have incidental diverticulosis with another definitive site [41]. The stigmata of significant hemorrhage seen at colonoscopy such as adherent clots, a nonbleeding visible vessel, or active bleeding have prognostic significance, and these patients are more likely to require transfusion and specific hemostatic therapy [26]. However, the majority of these patients, approximately 76%, stop bleeding spontaneously and do not require specific therapeutic intervention [8].

Semielective surgical therapy is usually offered after a second diverticular bleeding episode because once this has occurred, the risk that a third will follow exceeds 50% [88]. In a series of 83 conservatively managed cases of diverticular disease, the predicted yearly recurrence rates were 9% at 1 year, 10% at 2 years, 19% at 3 years, and 25% at 4 years [49].

Endoscopic treatment of bleeding secondary to diverticulosis includes contact coagulation [8, 27, 65], epinephrine injection [8, 66], hemoclip application [33], fibrin sealant [4], and a combination of the above. Epinephrine injection is the best endoscopic option for treatment. Our protocol is to use an epinephrine:saline (1:10,000) injection in 3–5-ml aliquots. A maximum of 20 cc can be given, if necessary. Bloomfeld et al. [8] reviewed the literature and found 48 patients treated endoscopically for diverticular bleed, all of whom had the stigmata for bleeding. The early rebleeding rate was low (15%). They concluded that colonoscopic therapy may be beneficial in reducing the risk of early rebleeding in patients with diverticular hemorrhage and stigmata of bleeding seen at colonoscopy.

### *Arteriovenous malformation*

Arteriovenous malformation (AVM) is a common cause of LGIB in elderly patients, but it is relatively rare in people under 50 years old [69]. The term arteriovenous malformation includes vascular ectasias, angiomas, and angiodysplasias. Colonic AVM is thought to result from intermittent low-grade obstruction of submucosal veins, because they penetrate the muscular layers of the colon and cause small arteriovenous communications [9]. Colonic AVMs are most commonly found in the cecum [10].

Moore et al. [58] reviewed and classified intestinal AVM based on angiographic characteristics, localization, age of the patient, and family history. Type 1 AVMs are solitary, localized lesions within the right side of the colon and usually occur in older patients. Type 2 AVMs are larger, occasionally visible, most commonly in the small intestine, and probably of congenital origin. Type 3 arteriovenous malformations are punctate angiomas causing gastrointestinal hemorrhage. Endoscopically, arteriovenous malformations generally appear as flat bright red lesions [18].

Typically, the bleeding caused by colonic AVMs is chronic, slow, and intermittent [86]. The bleeding stops spontaneously in 85%–90% of cases, but it recurs in 25%–85% [32]. All patients should undergo definitive surgical or colonoscopic treatment if a bleeding AVM has been identified.

Endoscopic options include multipolar coagulation and heater probe. Based on data from the CURE Hemostasis Group, the settings for bipolar coagulation are 10–16 W with 1- or 2-s pulses on a 50-W bipolar generator [50]. For heater probe coagulation, a setting of 10–15 J is used for either the small (2.4 mm) or the large (3.2 mm) probe [50]. Whitening of the entire angioma is the desired endpoint of treatment.

### Colitis

Colitis includes patients with inflammatory bowel disease (IBD), ischemic colitis, and infectious colitis. Patients with IBD usually present with bloody diarrhea that is not life threatening, though it has been reported [20]. Ulcerative colitis affects only the mucosa and submucosa of the rectum and colon. Crohn's disease may present with almost any GI symptom, depending on the site of the disease. The most common form of the disease is terminal ileal or ileocecal disease. In one review, 50% of patients with intestinal hemorrhage from IBD experienced spontaneous cessation of bleeding [71]. Approximately 35% of patients whose bleeding stops without intervention will have another bleeding episode. Because of this high recurrence rate, semielective surgery is recommended after the first episode of severe GI bleeding secondary to IBD (65).

Ischemic colitis is responsible for severe LGIB in 3%–12% of patients with colonic bleeding [49, 50, 63]. Patients usually present with acute onset of crampy abdominal pain. The patient's pain usually appears more severe than the actual physical exam. Diagnosis is dependent on a high suspicion for the disease. The best diagnostic test is flexible colonoscopy [40]. The splenic flexure and sigmoid colon, which have poor collateral blood flow (watershed area), are most often involved. Endoscopic findings include edema, erythema, submucosal hemorrhage, or partial mucosal necrosis with ulceration [78]. Colonic biopsies are usually definitive for the diagnosis and are useful for differentiating colonic ischemia from other inflammatory colitis. Treatment is usually supportive; antibiotics are indicated if fever or sepsis is present. Surgical intervention with resection is indicated if the patient develops peritoneal

signs or other evidence of bowel perforation. Therapeutic colonoscopy is indicated only if a focal ulcer with the stigmata of recent bleeding is found.

Although any type of infectious colitis may cause hematochezia, the most common types are enterohemorrhagic *Escherichia*, *Salmonella*, *Histoplasma*, and *Cytomegalovirus*. In general, these infectious sources for LGIB can be distinguished from other causes by a history of nonbloody diarrhea preceding the onset of bleeding.

### Radiation proctitis

Increasing use of radiation therapy to treat pelvic malignancies has led to a corresponding increase in the incidence of chronic radiation proctitis. Proctitis can range from minor blood with bowel movements to symptoms of tenesmus and diarrhea with frequent bleeding requiring multiple blood transfusions. Endoscopy shows friable, bleeding mucosa with areas of telangiectasias. Medical therapy includes anti-inflammatory agents in combination, rectal steroids alone, rectal sucralfate, short-chain fatty acid enemas, and different types of thermal therapy [22].

Endoscopic therapies include argon laser [84], Nd:YAG laser [87], argon plasma coagulation [80], heater probe, or bipolar endoscopic probe. Argon plasma coagulation involves the application of bipolar diathermy current using inert argon gas as a conducting medium, delivered via a through-the-scope catheter. Unlike in traditional bipolar devices, the current jumps from the probe to the target lesion, with the arc being broken once the tissue is desiccated. With heater probe or bipolar probe, fewer joules and total pulses are recommended for radiation proctitis.

### Neoplasia

Significant GI bleeding from colorectal neoplasia accounts for 7%–33% of cases of severe lower GI hemorrhage [40]. Such bleeding is believed to result from erosions on the luminal surface or polyps. Postpolypectomy hemorrhage can occur with a reported incidence between 1% and 6% [36, 68, 72]. Bleeding that occurs during and immediately after polypectomy is secondary to inadequate cauterization of the polypectomy site. Early rebleeding can be managed by resnaring the polyp stalk and applying holding pressure [91] or by application of a hemoclip. Delayed postpolypectomy hemorrhage is thought to be due to sloughing of the necrotic cauterized tissue in the induced ulcer, with erosion into underlying blood vessels.

Endoscopic methods for controlling bleeding from a postpolypectomy site include epinephrine injection initially, followed by thermal coagulation with the bipolar probe or heater probe on the visible vessel. If an adherent clot is present, inject the epinephrine around the clot before shaving it off to expose the vessel beneath it. If a nonbleeding visible vessel is found at the polypectomy site, thermal coagulation can be used alone or in combination with injection therapy [77].

Although polypectomy techniques vary greatly, there are measures that can be taken to help prevent bleeding [81]. In a prospective comparison study of 120 patients with 151 sessile polyps, epinephrine injection (1:10,000) before polypectomy compared with no injection was effective in preventing immediate bleeding [34]. In a randomized prospective study of 69 patients with 100 polyps greater than or equal to 1 cm, epinephrine injection before colonoscopic polypectomy was again found to be effective in preventing bleeding [23].

#### *Anorectal disease*

Hemorrhoids, ulcer/fissure disease, and fistula in ano must not be overlooked as causes of GI hemorrhage. Identification of a benign anorectal lesion does not eliminate the possibility of a more proximal cause of hemorrhage.

Hemorrhoids are the most common cause of LGIB in outpatient ambulatory adults. Symptomatic hemorrhoids have a prevalence of 4.4% in the general population and 36.4% in general practice [42]. In general, patients with hemorrhoids identified on physical examination should still undergo thorough endoscopic evaluation of the colon to rule out other pathologic conditions. Hemorrhoids are usually treated medically with fiber supplementation [3], stool softeners, low-dose steroid-containing suppositories, and Sitz baths. More aggressive treatments include band ligation, local injection, cryotherapy, infrared coagulation, laser photocoagulation, direct application of electrical current, and bipolar coagulation [28, 74, 83]. Endoscopic ligation is preferred over local injections or cryotherapy after the failure of medical management [51, 57]. Endoscopic band ligation includes retroflexing the colonoscope/sigmoidoscope and banding the largest internal hemorrhoid proximal to the dentate line. The treatment can cause severe pain if the bands are placed too low, and there is a small risk of perineal sepsis, which can, very rarely, be fatal [51]. Sepsis is a medical emergency signaled by fever, pain, swelling, and the inability to pass urine.

#### *Solitary rectal ulcer syndrome*

Solitary rectal ulcer syndrome (SRUS) is a misnomer for a benign disorder of uncertain origin characterized by the presence of a large ulcer in the mucosa of the mid-rectum. SRUS is a poorly understood clinical condition, but prolapse-induced rectal mucosal trauma or ischemia appears to contribute [45]. Patients usually experience symptoms of disordered defecation and tenesmus. Passage of mucus and blood per rectum is common, but active hemorrhage is an infrequent complication. On endoscopy, one or more well-demarcated ulcerations are seen with edematous, erythematous, and nodular borders [43]. Endoscopic therapy consists of coagulation with a large-contact thermal probe with or without injection of epinephrine. If there is clot and an actively bleeding ulcer, injection with epinephrine is recommended before coagulation. A cold polypectomy snare should be used to remove the clot and expose the vessel.

### **Surgical treatments of LGIB**

Surgical intervention is required when hemodynamic instability persists despite aggressive resuscitation, the blood transfusion requirement is greater than four units during the 24 hours before intervention and ten units overall, or if severe bleeding recurs. Surgical intervention for LGIB is necessary in 18%–25% of patients who require blood transfusion [55].

If the bleeding site can be localized preoperatively, a segmental colectomy is the operation of choice [89]. The average mortality is about 10%, and the average re-bleeding rate is about 5% [56]. However, if the bleeding site cannot be localized, a subtotal colectomy should be performed. This is associated with a rebleeding rate of 2% but a mortality rate of 20% [7].

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